AOML Keynotes
Miami, Florida
January-February 2001 Atlantic Oceanographic and Meteorological Laboratory Volume 5, Number 1/2

## Gas Ex-2001 Cruise Will Study Air-Sea Exchange of $CO_2$

In January, thirty-four scientists representing three NOAA research laboratories, six U.S. universities, and three foreign institutions embarked in Miami for an interdisciplinary research cruise focusing on the air-sea exchange of the greenhouse gas carbon dioxide ($CO_2$). The cruise aboard the NOAA Ship *Ronald H. Brown* will perform most of its research in the eastern equatorial Pacific along 3°S between 125°W-140°W. Gas Ex-2001 is a follow-up of the Gas Ex-98 cruise where, for the first time, the air-sea $CO_2$ flux was successfully measured directly on short time scales. The so-called direct gas flux measurements will greatly improve scientific understanding of the forcing functions on the kinetics of air-sea exchange. Since the oceans are a major sink of anthropogenic $CO_2$, constraints on the air-sea $CO_2$ flux will greatly enhance the ability to forecast future atmospheric $CO_2$ levels.

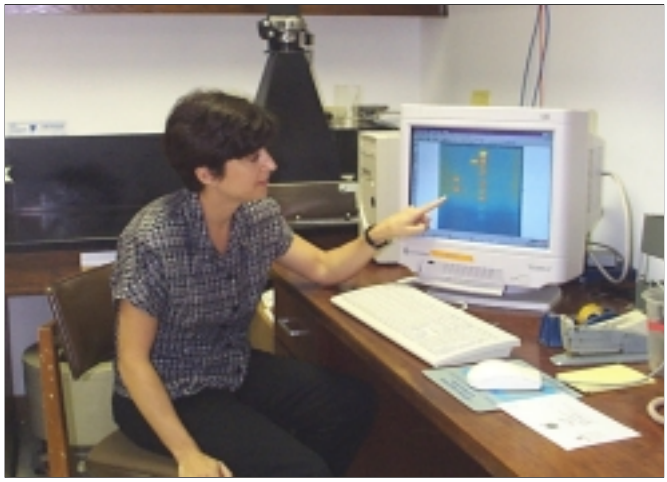
AOML scientists Rik Wanninkhof and Jia-Zhong Zhang have been funded by NOAA's Office of Global Programs to study small-scale variability in carbon and nutrient dynamics in the surface water and their influence on air-sea $CO_2$ fluxes. Robert Castle, Charles Fischer, and Brian Ward of AOML/CIMAS will also participate in the cruise which will take them from Miami, through the Panama Canal, and then on to Honolulu, Hawaii by the second week of March 2001.

**Martin Luther King Day**
**January 15, 2001**

## Extracting DNA in the UK

Molecular biology is a powerful tool which is finding increasing applications in the field of environmental microbiology. Gene-based studies are bringing the science of microbial biogeochemistry to a new level, helping to bridge the gap between laboratory and field studies. The pace of methodological advances can be daunting, with cutting edge techniques quickly becoming standard practice, but it's either jump on the ship or be left standing on the dock.

Last summer, Dr. Kelly Goodwin, microbiologist with AOML's Ocean Chemistry Division, began exploring DNA for NOAA by attending a New England Biolabs Molecular Biology and Polymerase Chain Reaction (PCR) Summer Workshop. While there, she was notified that she had received short-term funding to explore "Molecular Biological Techniques for Environmental Microbiology." With a smidgen of experience and funding, she set off for England to learn the "tricks of the trade." Dr. Goodwin spent five weeks in October-November 2000 working with Dr. Ian McDonald and Dr. Colin Murrell at the University of Warwick, Coventry, United Kingdom.



**Microbiologist Kelly Goodwin points out a band of amplified DNA from *Ruegeria algicola*, a relative of *R. methylhalovorans*.**

Dr. Goodwin and the members of the Warwick group are part of a community of $C_1$ microbiologists (microbiologists that specialize in the metabolism of one-carbon compounds) that frequently collaborate with one another. The Warwick Laboratory is a world leader in the genetics of $C_1$-utilizers, including bacteria that consume halocarbons, while Dr. Goodwin's expertise is on the biodegradation and biogeochemistry of halocarbons. Dr. McDonald and his students recently helped classify a new bacterium isolated by Dr. Goodwin and Ms. Jeffra Schaefer. This bacterium, designated *Ruegeria methylhalovorans*, is the first marine bacterium isolated using methyl bromide as a growth substrate. Methyl bromide is a fumigant that contributes to ozone-depletion, and there is much interest in quantifying its global budget.

*R. methylhalovorans* has an interesting biochemistry in that it can metabolize only a few compounds, but it has an enormous substrate concentration (*continued on page 2*)

## AOML's Diversity Seminar Series Presents

# Black Is... Black Ain't

*This 80-minute film by Marlon Riggs won the Filmmaker's Trophy for Best Documentary at the Sundance Film Festival and the Best Documentary at the San Francisco International Film Festival*

**February 6, 2001**

**12 Noon**

**First-Floor Conference Room**

# Blood Drive

**January 26, 2000**

**9:00 a.m.-12 Noon**

**4th Floor**

**Register at the receptionist's desk in the lobby**

Sponsored by:

**Community Blood Center of South Florida**

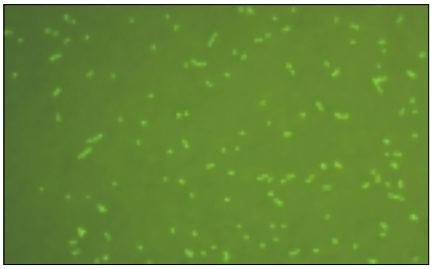
**(endorsed by the Red Cross)**

Washington's Birthday

February 19, 2001

*(continued from page 1)*

range. The bacterium can consume near-ambient concentrations of methyl bromide (~2 pM), but it also can grow on up to 500 M of this toxic substrate. Consumption of both high and low concentrations are of distinct environmental significance. For example, the ability to consume toxic levels of methyl bromide may find industrial applications because of environmental engineering efforts to limit the amount of methyl bromide escaping to the atmosphere during fumigation procedures. Also, there is general interest in dehalogenation because of efforts to remediate areas polluted with halogenated solvents. Consumption of ambient methyl bromide is of interest from the standpoint of global cycles, and *R. methylhalovorans* is used as a model to understand halocarbon microbial biogeochemistry. However, consumption of ambient concentrations usually is not assessed directly due to analytical limitations. Instead, biodegradation is often analyzed at higher concentrations and extrapolated to low concentrations. Such extrapolations are valid as long as the enzyme system that is being assessed in the laboratory is what is actually expressed in the environment.



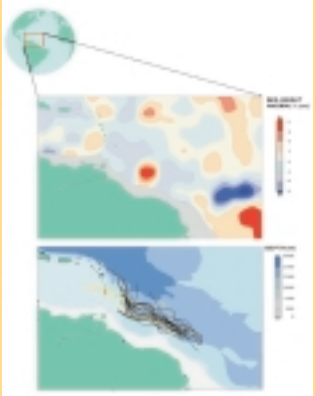
**Microscopic view of the newly classified bacterium *Ruegeria methylhalovorans*.**

Traditional kinetics experiments were not tackling these issues adequately; therefore, Dr. Goodwin decided to use a molecular approach. The first step to this molecular approach was identifying and sequencing the gene or genes responsible for methyl bromide degradation. Luckily, the Warwick group had already sequenced functional genes involved in methyl bromide degradation from two terrestrial halocarbon-degrading bacteria. This gave a starting point for designing primers and probes to identify the appropriate gene(s) in *R. methylhalovorans*.

Several approaches were used simultaneously to maximize the chance of identifying the gene during Dr. Goodwin's relatively short stay in the United Kingdom. In one approach, total protein was extracted from cultures grown under various conditions. The protein was run on gels, stained, and the gels were scrutinized for proteins induced during degradation of methyl bromide. Those proteins then would be sequenced and the amino acid sequence would be used to backtrack to the DNA sequence that codes for that protein. In another approach, total DNA was extracted, digested with restriction enzymes, run on a gel, and fixed on blotting paper. The DNA was then hybridized with radiolabeled probes designed from DNA sequences of the (hopefully homologous) genes from the terrestrial methyl-bromide degrading bacteria. The last approach used PCR to amplify specific DNA sequences from the total DNA extracted from the bacterial cultures. The DNA was amplified using primers based, again, on the genes sequenced from the terrestrial methyl bromide degraders.

The work proceeded efficiently using a three-person team consisting of Dr. Goodwin, Dr. McDonald, and graduate student, Karen Warner. Indeed, the team obtained initial sequence for a gene involved in methyl bromide degradation (called the *cmu*A gene) by the end of Dr. Goodwin's stay. Significant progress was made in a short amount of time, and Dr. Goodwin returned with knowledge and skills that will enable her to explore genomes at AOML.

**The cover of the January 2001 issue of *Geophysical Research Letters* (volume 28, number 1) features a graphic from an article written by AOML's Gustavo Goñi, oceanographer with the Physical Oceanography Division, and William Johns of the University of Miami's Rosenstiel School. The graphic (at right) serves as a figure for their article entitled "A census of North Brazil Current rings observed from TOPEX/POSEIDON altimetry: 1992-1998" (GRL, 28(1):1-4, 2001). The top panel illustrates a sea height anomaly that formed off the northeast South American coast in December 1996. The bottom panel illustrates the North Brazil Current ring trajectories for the period October 1992-1998.**



## HRD Staff Participate in Winter Storms Project

Members of AOML's Hurricane Research Division are participating in the National Center for Environmental Prediction's (NCEP) Winter Storms Reconnaissance Project this January-March 2001. The Winter Storms project seeks to improve forecasts of winter storms that impact the United States, primarily along the west coast, but also focuses upon areas in the midwest and the east coast as well.

Neal Dorst, Stanley Goldenberg, and Paul Leighton will travel to Honolulu, Hawaii, on a rotational basis aboard NOAA's Gulfstream-IV jet to assist NCEP with data acquisition reconnaissance missions. The missions are aimed at measuring the strength of the jet stream by deploying GPS dropsondes from the stratosphere along flight tracks in the North Pacific Ocean.

**Paul Leighton (seated at left) aboard NOAA's Gulfstream IV jet during a data acquisition reconnaissance flight for the National Center for Atmospheric Research.**

The 2001 season marks the fourth consecutive year of the project. Preliminary results from the previous three years show dramatic improvement of numerical forecasts for targeted areas in the United States.

During the Winter Storms project, HRD staff members will also participate in a series of reconnaissance missions that will attempt to measure areas of clear air turbulence. In addition, the last week of the Winter Storms Project will be combined with NOAA's Pacific Landfalling Jets Experiment (PACJET) flown out of Monterey, California. HRD staff members will assist PACJET with data acquistion efforts aimed at measuring the interaction of Pacific low pressure systems with the jet stream. PACJET seeks to develop and test methods to improve short-term (0-24 h) forecasts of damaging weather on the U.S. west coast from landfalling winter storms emerging from the data sparse Pacific Ocean.

## NOAA Helps Make the Bowl a Ball

*Erica Van Coverden*

Many high school students with a keen interest in ocean-related sciences are preparing for this spring's National Ocean Sciences Bowl (NOSB). The NOSB is a game show-style team competition that tests students' knowledge in all areas of marine studies.

For the past three years, AOML scientists have volunteered as part of the judging teams needed to run the competitions. "This is my second year participating in the NOSB," said Shirley Murillo, a research meteorologist at AOML. "What brought me back was seeing how motivated the students are and how seriously they take the competition. They study so much; it's encouraging to see students put so much effort into preparing for the competition."

**Gustavo Goñi, a physical oceanographer at AOML, and Shirley Murrillo, a research meteorologist, will both participate as judges in the Miami NOSB regional competition.**

The goal of every student participating is to make it to the finals, but first they have to win their regional competition. This February, 19 regional NOSB competitions will take place all over the United States, including Miami, where AOML will help the University of Miami's Rosenstiel School with their competition. On February 10-11, 14 AOML scientists and employees will play their role as moderators, science judges, and rules judges for the Miami regional NOSB.

"It's just plain fun," said Gustavo Goñi, a physical oceanographer. "This type of competition encourages students to get more involved in the study of the environment, and being a judge helps me to support their effort. These kids are really bright, and it's very entertaining to see them compete to show their knowledge of ocean sciences."

The winner of each regional competition will advance to the NOSB finals competition, which will take place April 1-3, 2001 on Miami Beach.

### Pre-Retirement Workshop and Individual Retirement Counseling

**February 28, 2001**

**8:30 a.m. – 4:00 p.m.**

**First-Floor Conference Room**

**Presentors:**

***Yolanda Pacheco (benefits specialist)****

***Lori Osborn (personnel assistant)***

**NOAA/Mountain Administrative Support Center/Human Resources Division**

***Dorothy Clark***

**Social Security Administration**

*On March 1, 2001, Yolanda Pacheco is available to meet individually with employees serviced by MASC/HR who are close to retirement and seek further insight into their specific situation

**Contact Howard Friedman to register or to schedule an individual counseling session with Yolanda Pacheco**

**(305-361-4319 or Howard.Friedman@noaa.gov)**

## Welcome Aboard

Brian Ward joins the staff of the Ocean Chemistry Division as a CIMAS post-doctoral fellow. While at AOML, he will study the effect of near surface temperature and salinity gradients on air-sea $CO_2$ fluxes while working with OCD's $CO_2$ group. He will also collaborate with Dr. Peter Minnett of the Rosenstiel School in studies at the Miami Wind-Wave Interaction Facility to investigate the effect of waves on the surface thermal gradient. During his previous employment at the Geophysical Institute in Bergen, Norway, he developed an autonomous profiler to measure near surface temperature, conductivity, and chemical profiles. His Skin Depth Experimental Profiler (SkinDeEP) has clear utility for surface heat and water flux measurements.

## Congratulations

Frank Marks, meteorologist with the Hurricane Research Division, was elected and installed as a Fellow of the American Meteorological Society during the AMS 81st Annual Meeting in Albuquerque, New Mexico in January 2001.

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An article written by Mark Powell on training methods for windsurfing competition, based on his preparations for the U.S. Olympic Trials, appears in the December 2000 issue of *Sailing World* magazine.

## First Aid/CPR Training Class

**January 12, 2001**

**9:00 a.m. - 4:00 p.m.**

**First-Floor Conference Room**

**Contact Joe Pica to register or for more information (305-361-4544 or Joseph.A.Pica@noaa.gov)**

**Sponsored by the American Red Cross**

## A Bit of History Finds a Home at PMEL


**Eddie Bernard, PMEL Director, accepts a hand-carved quarterboard from the decommissioned NOAA Ship *Discoverer* from AOML Deputy Director Judy Gray and AOML Director Kristina Katsaros.**

In January 2001, AOML Director Kristina Katsaros and AOML Deputy Director Judy Gray visited the Pacific Marine Environmental Laboratory (PMEL) in Seattle, Washington to donate a hand-carved quarterboard from the decommissioned NOAA Ship *Discoverer*. The "*Disco*," as the ship was more commonly referred to in its day, was one of the first research vessels used for scientific expeditions at sea by AOML and PMEL principal investigators. Commissioned in April 1967, the *Discoverer* and its sister ship *Oceanographer* were the largest and most automated oceanographic research vessels of their time in the United States. The quarterboard was hand-carved in the late 1960s for Dr. Harris B. Stewart, AOML founder and first director, by Dr. George Merrill, a master woodcarver and scientist with AOML's now defunct Marine Geology and Geophysics Laboratory. Upon Stewart's death in April 2000, the Stewart family donated the quarterboard to AOML. They subsequently approved donation of the quarterboard to AOML's sister laboratory, PMEL, in the Pacific.

## Visitors

**Dr. David Palmer, Prof. Frederick Tappert (UM/RSMAS), Prof. Natalia Grigorieva, and Prof. Michael Brown (UM/RSMAS), after lunch at a local restaurant.**

Professor Natalie Grigorieva, Department of Applied Mathematics and Mathematical Modeling, St. Petersburg State University of Ocean Technology, St. Petersburg, Russia, visited AOML for a 10-day period near the end of January 2001. During her visit, she worked with Dr. David Palmer, physicist with AOML's Remote Sensing Division, to develop a program that will apply a formalism developed by V. S. Buldyrev to the interpretation of data collected from some U.S. ocean acoustic remote sensing experiments. Prof. Grigorieva also worked with Dr. Palmer on the drafts of two manuscripts that they are co-authoring with Dr. Gregory M. Fridman.

Professor Grigorieva teaches courses in pure and applied mathematics and has lectured in Sweden and France. She presently is a consultant for the international sonar manufacturer, Thomson Marconi Sonar, Ltd. She is known in St. Petersburg for having presented a lecture series on St. Petersburg Educational Television. Her visit to AOML was sponsored by the U.S. Office of Naval Research.

Christopher McArthur, an environmental engineer with the Environmental Protection Agency in Atlanta, Georgia, will be a guest of AOML's Remote Sensing Division for a period of three months beginning in February. Mr. McArthur will assist RSD staff with data collection and analysis of the environmental effects of dredged material disposal at various southeast Florida ocean dredged material disposal sites (ODMDSs), with particular focus on the Miami ODMDS Monitoring Study site (MOMS).

## Travel

Michael Farmer attended the U.S. Environmental Protection Agency's Resource Conservation and Recovery Act (RCRA) training program for hazardous/toxic waste management in Atlanta, Georgia on January 22-23, 2001.

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Peter Black, Howard Friedman, Kristina Katsaros, Christopher Landsea, Frank Marks, and Shirley Murillo attended the American Meteorological Society's 81st Annual Meeting in Albuquerque, New Mexico on January 14-19, 2001.

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Rik Wanninkhof, Robert Castle, Charles Fischer, and Brian Ward will participate in the Gas Ex-2001 cruise aboard the NOAA ship *Ronald H. Brown* on January 25-March 8, 2001. The ship departed from Miami on January 25th and will travel to Panama and then on to Honolulu, Hawaii.

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Hugh Willoughby participated in a peer-review panel for proposals submitted to NASA for the Fourth Convection and Mesoscale Experiment (CAMEX4) in Washington, D.C. on January 29-31, 2001.

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Molly Baringer participated in the visiting scientist program aboard the Royal Caribbean Cruise Lines ship *Explorer of the Seas* on January 20-27, 2001.

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Kristina Katsaros attended the Senior Research Council Meeting in Boulder, Colorado on January 30-February 1, 2001.

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Paul Willis participated as cloud physics scientst in the Airborne Field Mill Project at Kennedy Space Center in Coco Beach, Florida on January 31-February 3, 2001.

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Sim Aberson will attend a NOAA Diversity Council Meeting in Silver Spring, Maryland on February 14-16, 2001.

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Christopher Landsea will participate in a collaborative project on the reanalysis of hurricane data for Cuba in Havana, Cuba on February 19-25, 2001.

**NOAA Policies forms (from the AOML Handbook) should be returned to Jannette Perez, Office of the Director.**

## January-February 2001 Informal Seminars*

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| **January 9** | ***Decadal/Multidecadal Signals in Surface Meteorological and Subsurface Oceanographic Properties: Observing Systems, Signal Characteristics, and Model Results*** **Dr. Robert Molinari, Physical Oceanography Division** |
| **January 11** | ***Eastern Pacific Hurricanes Jimena of 1991 and Olivia of 1994: The Effects of Vertical Shear and Ocean Temperature on Structure and Intensity*** **Dr. Hugh Willoughby, Mr. Michael Black, Dr. Frank Marks, and Dr. John Gamache, Hurricane Research Division** **Mr. Christopher Samsury, The Weather Channel** |
| **January 30** | ***Modeling Carbon Cycles in the Pacific Ocean*** **Dr. Tsung-Hung Peng, Ocean Chemistry Division** |
| **February 6** | ***The Atlantic Multidecadal Oscillation and its Effects on Climate*** **Dr. David Enfield, Physical Oceanography Division** |
| **February 13** | ***Cycling of Methyl Bromide in the North Atlantic and Eastern Pacific Oceans*** **Dr. Shari Yvon-Lewis, Ocean Chemistry Division** |
| **February 15** | ***SST Variability in Hurricanes: Implications with Respect to Intensity Change*** **Dr. Joseph Cione, Hurricane Research Division** |
| **February 20** | ***Hurricane Loss Projection: Possible Framework for a Public, State of Florida, Wind Loss Model*** **Dr. Mark Powell, Hurricane Research Division** |
| **February 23** | ***Atlantic Climate Variability and its Associated Atmospheric Circulation Cells*** **Dr. Chunzai Wang, Physical Oceanography Division** |
| **February 27** | ***Sixteen Years of Florida Current Measurements*** **Dr. Molly Baringer, Physical Oceanography Division** |

***Presentations begin at 3:00 p.m. in the first-floor conference room. Coffee and tea are served at 2:45 p.m.**

***Keynotes*** **can be viewed online in PDF format at the following World-Wide Web Internet address: http://www.aoml.noaa.gov/keynotes**

*Keynotes* is published monthly by the Atlantic Oceanographic and Meteorological Laboratory. Contributions are welcome and should be submitted prior to the last week of each month to ensure inclusion in the following month's edition. Please address all correspondence to: Office of the Director, 4301 Rickenbacker Causeway, Miami, FL 33149. Contributions may also be submitted by fax at (305) 361-4421 or by email (derr@aoml.noaa.gov).

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The deadline for submitting material for the March issue of *Keynotes* is February 23, 2001.